Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Service Rules for Advanced Wireless Services In the 1.7 GHz and 2.1 GHz Bands	))	WT Docket No. 02-353
	)	

REPLY COMMENTS OF THE TDD COALITION

TDD COALITION

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March 14, 2003

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REPLY COMMENTS OF THE TDD COALITION

The TDD Coalition ("Coalition") hereby submits the following comments to the Further Notice of Proposed Rulemaking ("Further Notice") in the above-captioned matter.

I. ABOUT THE TDD COALITION.

The Coalition is a not-for-profit corporation organized to represent the interests of its members, which consist of providers of fixed and mobile wireless voice and data communications service in the United States and abroad. Among the Coalition's purposes are to promote time division duplexing ("TDD") technologies for wireless broadband products and services; to inform the industry about TDD technologies and its benefits to the global broadband wireless industry; to develop common marketing approaches as they relate to TDD; to provide information to international and national regulatory bodies in furtherance of adopting technologically neutral rules that allow economical deployment of TDD technologies for broadband wireless access; to develop implementation guidelines that will facilitate TDD deployments and ensure harmonious coexistence of TDD with other duplexing systems; and to foster the support of TDD technologies within global, regional and national standards organizations.

II. THE COALITION'S INTEREST IN THE CAPTIONED PROCEEDING.

The Coalition supports the order of the Federal Communications Commission ("FCC") to allocate the 1710-1755 MHz and 2110-2155 MHz frequency bands to provide for the introduction of new advanced wireless services. The Coalition believes that TDD technologies will enable service providers to provision new services within this new spectrum, particularly high-speed data-related services, at their highest value and with minimal cost. This is based on our recognition of the highly spectrally efficient nature of TDD-based technologies, and our expectation that unpaired spectrum will cost service providers much less than spectrum allocated on a paired basis. The cost effective nature of WLAN technologies, along with its efficient performance at high data rates, is a good example. Our belief is that dedicated TDD technologies will significantly outperform FDD technologies in the data services domain, while doing so at a lower cost to providers. Therefore, the Coalition concurs with the FCC's efforts to facilitate the provisioning of new services by eliminating the barrier that restricts the technology choices.

III. REQUESTED COMMENT RESPONSES.

FCC Item 4: "… In November 1999, the Commission issued a *Policy Statement* setting forth guiding principles for spectrum management activities in the new millennium. Key among these principles is a policy favoring flexible allocations: allowing licensees greater freedom to determine the specific technologies to be used and services to be offered, and allowing licensees to negotiate among themselves arrangements for avoiding interference rather than applying mandatory technical rules to control interference."

TDD Coalition Response: The Coalition agrees that the FCC's policy of flexible allocations will assist it in achieving its goal of providing greater freedom in determining the "specific technologies to be used and services to be offered," and to achieve its goal of promoting competitive access to spectrum for a larger number of companies, large and small. This includes smaller companies that have developed, or are in the process of developing, state-of-the-art TDD-based technologies.

FCC Item 10: "Thus, in a 1999 *Policy Statement* on spectrum management, the Commission observed that "[i]n the majority of cases, efficient spectrum markets will lead to use of spectrum for the highest value end use," and that "[f]lexible allocations may result in more efficient spectrum markets."

TDD Coalition Response: The Coalition concurs with your observation that "flexible allocations may result in more efficient spectrum markets." Our contention all along has been that TDD, in and of itself, is a very spectrally efficient technology that will only grow in popular acceptance and deployment in the near future, especially if the FCC allocates spectrum that is conducive to TDD systems operation.

FCC Item 11: "… Here, as in the 700 MHz proceeding, adoption of the flexible use proposal would allow the spectrum to be employed for a full range of allocated services. Further, it is consistent with our obligation to auction the majority of the AWS bands through competitive bidding."

TDD Coalition Response: The TDD Coalition agrees with the FCC's use of the flexible use proposal as it allows for spectrum to be used for a "full range of allocated services," including services using TDD-based technologies. We believe that the auction of AWS bands through competitive bidding will result in a more effective, market-driven use of this spectrum.

FCC Item 12: "The decision adopted in the *AWS Allocation Order* permits fixed and mobile services in the 1710-1755 MHz and 2110-2155 MHz bands. … We seek comment on whether permitting flexible use of this spectrum would meet the criteria specified in section 303(y)(2), and if so, the degree of flexibility that should be afforded licensees using this spectrum."

Section 303(y)(2) of the Communications Act of 1934 reads:

"(y) Have authority to allocate electromagnetic spectrum so as to provide flexibility of use, if –

(2) the Commission finds, after notice and opportunity for public comment, that –

(A) such an allocation would be in the public interest;

(B) such use would not deter investment in communications services and systems, or technology development; and

(C) such use would not result in harmful interference among users.

TDD Coalition Response: The Coalition believes that permitting the flexibility of this spectrum would be in the public interest due to the increase in the number of companies desiring to offer wireless data services nationwide, and customers wishing to access data from the Internet and from the business LANs wherever they are located. Recent increases in WLAN implementations throughout the US will only be assisted by any new spectrum allocations that allow for the broader use of TDD-based technologies, which are cheaper to implement and more spectrally efficient. Furthermore, investment in TDD-based products and services will accelerate if spectrum is made available for the unrestricted implementation of these new technologies. Finally, ITU-R Working Party 8F is in the process of developing a new report, shown in document 8F/827 Attachment 7.4: *"Working Document Towards a Preliminary Draft New Report on Mitigating Techniques to Address Coexistence Between IMT-2000 TDD And FDD Radio Interface Technologies Within The Frequency Range 2500-2690 MHz Operating in Adjacent Bands and in the Same Geographical Area"* that describes how various mitigation techniques can be applied to facilitate coexistence between TDD and FDD technologies operating in adjacent bands. The report indicates that these efforts for coexistence and flexibility in choosing various technologies for spectrum allocation will negate any significant potential interference that occurs when differing technologies are permitted to co-locate within the same spectrum band.

As for the degree of flexibility that should be afforded licensees using this spectrum, we feel that as long as companies deploy systems that do not interfere with other adjacent systems above a specified threshold (as outlined in FCC Rules Part 27), then complete unrestricted use of the spectrum should be afforded.

FCC Item 13: "… we also seek comment on what additional rule provisions should be included in Part 27 or incorporated by reference, in light of the services that may be offered under a flexible use approach."

TDD Coalition Response: We feel that Part 27 needs no more additional rules. In fact, we rather agree with the scope of Part 27.64 "Protection from Interference," in that operators are required to abide by FCC Rules and Regulations, and should be, in general, "non-interfering." Part 27.64(a) and (b) outlines the consequences for "failure to operate as authorized," and emphasizes resolution by technical means. We feel that this is sufficient to encourage the use of systems that are "good spectral neighbors" by stating how the FCC, in general, will maintain cooperation in this band. Also, we feel that there is no need to modify section (c) in anyway, since transmission flexibility should be maintained as much as possible, except where it violates section (a).

FCC Item 14: "We seek comment on whether the 1710-1755 MHz and 2110-2155 MHz bands should be governed by Part 24 or Part 22, or by some other existing part of our rules."

TDD Coalition Response: We feel that Part 27 is sufficient to govern this band due to its flexible nature, and the fact that it was created for miscellaneous wireless services, and their interoperability. We also believe the undue harm to new innovative technologies using this spectrum may result if restrictive rules changes to Part 27 are put in place prior to knowing how various technologies will interact (i.e., interference issues). We feel that interoperability issues can be resolved between companies, and that if the need arises, Part 27 can be modified accordingly.

FCC Item 15: "… Nonetheless, we tentatively conclude that it serves the public interest to assign licensees for all portions of the AWS bands by the same mechanism. …"

TDD Coalition Response: We agree with the FCC's conclusion on this issue.

FCC Item 28: "Alternatively, we could license this spectrum using varied block sizes. Under this approach, for each geographic licensing area, we could, for example, specify two licenses of 25 megahertz each, another of 20 megahertz, and two of 10 megahertz. One reason for licensing this spectrum in different block sizes is that licensees who planned to use smaller blocks of spectrum would not be required to acquire more spectrum than they need for their operations. This approach could save time and resources, and also could expedite the development and offering of services."

TDD Coalition Response: The Coalition notes that in your example (above), you indicate five separate spectrum blocks for allocation, with only one of 20 MHz, thus implying that the two bands would not allocated symmetrically. The Coalition would have no issues in seeing the spectrum allocated in a similar fashion. The issue of paired or unpaired spectrum is not a major concern for TDD technologies – TDD can operate effectively in spectrum that is allocated in either way. However, the Coalition feels that in order for smaller businesses to be able to acquire spectrum fairly, and to make the most efficient use of it, spectrum should be allocated as follows:

1) Four licenses of 15 MHz;
2) Two licenses of 10 MHz; and
3) Two licenses of 5 MHz.

As a proponent for TDD-based technologies, we feel that technologies that are highly efficient for data traffic services, such as TDD, should be able to operate in large and small networks as the market requires. Requiring the dividing of all spectrum into large blocks would not be the most efficient use of the spectrum in all markets, and therefore would not be in the public interest.

FCC Item 29: "We also seek comment on the appropriate relationship between the geographic area of licenses and spectrum block size. For example, would a mix of different geographic license areas be best accompanied by different spectrum block sizes, presumably with larger geographic area licenses matched with larger frequency blocks, and smaller area licenses matched with smaller frequency blocks? This was the approach we took with PCS licensing, where we divided the country into 51 relatively large geographic areas for two 30-megahertz licenses, and 493 smaller areas for the remaining four licenses. What are the advantages and disadvantages of such an approach?"

TDD Coalition Response: We believe that a geographic method to the PCS allocation division should be used for the AWS bands. However, given the variety of innovative technologies that will be used, we recommend the following spectrum block allocation (mentioned in Item 28 response, above), with the trading area types indicated:

1) Four licenses of 15 MHz (MTA);
2) Two licenses of 10 MHz and (MTA or BTA);
3) Two licenses of 5 MHz (BTA).

FCC Item 30: "In the *AWS Allocation Order*, we noted that most carriers in the US have indicated plans to provide service that meet the IMT-2000 data rates by deploying systems based on CDMA2000 and W-CDMA technologies. These technologies used paired channels of 1.25 to 7.5 MHz. We therefore seek comment on whether the ability of applicants to aggregate spectrum and disaggregate spectrum post-auction – both geographically and by frequency –

suggest we should simply divide this spectrum into smaller frequency blocks (for example, five megahertz or even less) and let applicants assemble whatever spectrum they want? What are the advantages and disadvantages of such a "building block" approach?"

<u>TDD Coalition Response</u>: Although the TDD Coalition has presented an example of a spectrum size block allocation, we would not object to a "building block" approach as long as sufficient spectrum (in small block sizes) was made available for small businesses. This is especially true for companies interested in deploying TDD-based technologies that may not require large blocks of spectrum in smaller geographic areas.

<u>FCC Item 31</u>: "… While paired spectrum is ideal for operating modes such as frequency division duplex (FDD), it is unnecessary for one-way or time division duplex (TDD) communications. We there seek comment on whether the 1710-1755 MHz and 2110-2155 MHz bands should be licensed using paired or unpaired spectrum blocks, or a combination of paired and unpaired. … Furthermore, we request comment on the impact that our decisions on the spectrum blocks and service areas should have on our decision on whether to adopt paired or unpaired spectrum bands."

<u>TDD Coalition Response</u>: In light of the FCC's efforts to remain flexible and accommodating to innovative technologies, especially with regard to efficient data transmission, allocating a combination of paired and unpaired spectrum bands is the most consistent choice for this initiative. Carriers seeking to deploy paired technologies are free to seek available spectrum that serve their purpose, without unduly restricting technologies that do not require paired technology. Also, TDD-based technologies do not require that the spectrum be symmetric or asymmetric. We believe that some of the spectrum in this band should be allocated as unpaired. More importantly though, if all of the AWS spectrum is paired, then unrestricted access to this spectrum should be made available to technologies, such as TDD, which transmit and receive within the same frequency band.

<u>FCC Item 32</u>: "We request comment on the degree to which paired or unpaired bands are suited to new technologies, particularly such technologies that would enhance the offering of advanced wireless telecommunications services. Comments should address the particular requirements of the various services and their technologies, including transmission modes such as FDD and TDD, that would use this spectrum, and the impact on such services and technologies of our adopting either a paired and unpaired band architecture."

<u>TDD Coalition Response</u>: The efficient transmission of high-speed data is quickly being realized by the WLAN revolution which is based on TDD communications. We feel that FDD is not spectrally efficient enough to deliver advanced wireless services for high-speed data use. TDD has been shown to be significantly more efficient in the delivery of data services, including Internet access, streaming video, etc. We feel that the public interest for inexpensive advanced high-speed data services will be best served by TDD technologies that require unpaired spectrum allocations in the AWS band. Therefore, if the spectrum is allocated as paired spectrum, then TDD will be able to make the most efficient use of it as it will be able to provide a larger number of high-speed data users for this spectrum than with a similar FDD technology.

<u>FCC Item 42</u>: "… Should there be any set-asides for new entrants or other types of applicants? … Are there potential licensees or classes of licensees whose use of these bands would undermine competition such that we should consider such restrictions?"

<u>TDD Coalition Response</u>: In the interest of promoting new technologies that offer significant increases in high-speed data transmission, we would entertain the possibility of small spectrum block "set-asides" for new entrants that have not historically had spectrum available in significant quantities. We also feel that large PCS licensees, who may seek to purchase significantly large quantities of this AWS band, form a threat to competition for this spectrum. This would also undermine the FCC's goal to open this spectrum to new advanced technologies.

IV. RESPONSE TO INITIAL COMMENTS ON FCC 02-353

The TDD Coalition has the following responses to initial comments on FCC 02-353:

A. National Radio Astronomy Observatory (NRAO)

In their comments to the FCC on 02-353, the NRAO states:

NRAO (1): "The NRAO urges the Commission to adopt a licensing methodology that will permit rapid identification of the spectrum user in the event that harmful interference is received at a radio astronomy facility.

TDD Coalition Response to NRAO (1): The TDD Coalition agrees with the NRAO that spectrum interferers should be identified by the quickest means possible, and we have faith that the FCC will implement the resources to do so. However, we feel that the idea of inter-operator interference within the band should not be seen as a cause for limiting access to this spectrum to as many technologies as possible, but only as a means to make sure that all users will use the spectrum harmoniously.

B. Nokia, Inc.

In their comments to the FCC on 02-353, Nokia, Inc. states:

Nokia (1): "Nokia believes that the best use of this spectrum would be accomplished by assigning the lower frequencies (1710-1755 MHz) for mobile transmit and the upper frequencies (2110-2155 MHz) for base transmit. This assignment makes the most sense in terms of both technical considerations and global spectrum harmonization and for this reason was recommended by ITU-R Working Party 8F (ITU-R WP8F) in ITU-R M.1036, the draft recommendation on Frequency Arrangements for Implementation of International Mobile

Telecommunications-2000 (IMT-2000) in the Bands 806-960 MHz, 1710-2025 MHz, 2110-2200 MHz and 2500-2690 MHz, Doc. 8F/TEMP/330r2 (ITU-R M.1036)."

TDD Coalition Response to Nokia (1): In limiting the "lower frequencies" to mobile transmit, and the "upper frequencies" to base transmit, the TDD Coalition notes that this segments this new spectrum so that only FDD technologies can be used. The TDD Coalition disagrees with this proposal that goes against the FCC's policy of flexible allocations to promote advanced wireless communication service. Following this type of frequency assignment method would not allow for TDD-based services which both transmit and receive in the same frequency band. We strongly urge the Commission not to implement the frequency assignment method that Nokia has outlined in their comments.

Nokia (2): "The mobile and base transmitters should be separated to avoid severe interference. If the Commission were to permit the use of both base and mobile transmitters in both bands, one option raised in the NPRM, interference would occur between base stations, as well as between mobile stations. As with any paired spectrum system, some frequency separation between uplink and downlink is required to prevent harmful interference. Likewise, Nokia strongly recommends against establishing technical rules for these bands that would encourage both TDD and FDD use in these bands. Even with the introduction of tighter RF filtering requirements, interference caused by TDD and FDD co-existence would be severe. The studies regarding TDD and FDD co-existence are either still ongoing or show a need to introduce large guard bands between TDD and FDD to mitigate interference. Introduction of large guard bands would be an inefficient use of spectrum, wasting valuable mobile frequencies below 3 GHz.

Additionally, introduction of TDD in these bands would require significant and complex re-engineering for all systems in the band."

<u>TDD Coalition Response to Nokia (2)</u>: The TDD Coalition is confused by this statement (above) from Nokia.

1) Nokia's comment: "Even with the introduction of tighter RF filtering requirements …" under-estimates the effects of available adaptive antenna techniques, interference-reducing codes, etc., as well as on-going research techniques, to reduce the "severe" interference that is mentioned. Operators in Europe with TDD and FDD spectrum are solving these interferences issues for pre-commercial deployment. Restricting the spectrum to accommodate the limitations of current technologies, such as those based on FDD, limits the future of advanced wireless innovations that the FCC seeks to have developed. Besides, for an equal amount of spectrum, FDD-based technologies under-perform TDD-based technologies in providing high-speed data transmission. Part 27 rules protecting operators from outside interference should be implemented to regulate any "severe" interference situations that may occur.

2) Given that FDD implementations **require** a separation of spectrum between base station and mobile transmission bands, how could any technology be more inefficient than one that requires one band to transmit, and another band to receive? Technologies that transmit and receive high-speed data within the same frequency band (such as TDD) actually present a **more efficient** use spectrum while providing better transmission performance than voice-centered FDD-based technologies.

Nokia (3): "TDD use in the bands 1710-1755 MHz and 2110-2155 MHz limits the benefits of global spectrum harmonization in these bands by introducing a frequency arrangement that will be unique on an international basis. ITU-R M.1036 only recommends FDD in the 1.7 GHz and 2.1GHz bands and in fact, recommends they be used for uplink and downlink, respectively, in Option B6 of ITU-R M.1036. The 2110-2170 MHz band is already identified and being used for downlink in IMT-2000 networks in several countries that elected to allocate the bands 1920-1980 MHz (for mobile transmit) and 2110-2170 MHz (for base transmit) identified for IMT-2000 at the World Radio Communications Conference-1992 (in WARC-9211). To introduce TDD into the 2110-2170 MHz band would create a unique frequency arrangement, rather than take advantage of the benefits of global harmonization of this upper band. The Commission should seek to maximize global spectrum harmonization, particularly in spectrum such as 2110-2170 MHz where this is possible. Global spectrum harmonization provides benefits to consumers, manufacturers and operators by creating economies of scale that allow more affordable equipment with greater variety, while facilitating global roaming."

TDD Coalition Response to Nokia (3): Given the technical issues and delays experienced by the current global 3G deployments, and the fact that WCDMA and CDMA2000 1x systems, given their significant differences in chip-rate and frame structure, are far from being "harmonized" in the near-future, the TDD Coalition feels that this argument should not be a chief concern with regards to the future of US AWS allocations. Likewise, little of the already-allocated (FDD-based) PCS spectrum (i.e., 1850 – 2025 MHz) is aligned according to ITU IMT-2000 recommendations. We feel that Nokia is over-stating the benefit to customers that global harmonization offers given the success of non-harmonized global 2G networks, and the unpredictable success of 3G networks moving forward. In short, believing that global harmonization, in itself, provides a significant benefit to US cellular consumers is incorrect in the opinion of the TDD Coalition.

Nokia (4): " Nokia believes that there are two primary options that should be considered:

- Three licenses of 2x15 MHz of contiguous paired spectrum enabling three operators, or
- Three licenses of 2x10 MHz of contiguous paired spectrum and one license of 2x15MHz of contiguous paired spectrum, enabling four operators.

In choosing among these options the Commission must weigh the benefits of each option. The first option is sufficiently wide to adequately support hierarchical cell layers and the full range of high bit-rate services envisioned for advanced wireless services. The second option creates a more competitive market with the addition of a fourth operator. Nokia believes that the spectrum included in each license should be paired and symmetrical. The spectrum at 1710-1755 MHz and 2110-2155 MHz is already ideally suited for symmetrical pairing and is a recommended frequency arrangement, Option B6, in ITU-R M.1036. To introduce unpaired spectrum would add unneeded complexity to this band without any clear benefits. At this current time, symmetrical operations and services are expected to be the norm and the spectrum allocation should reflect this reality. In the future, however, asymmetrical uses may increase with more downlink spectrum needed than uplink."

TDD Coalition Response to Nokia (4): The TDD Coalitions feels that in order for smaller businesses to be the most fairly able to acquire spectrum, and to make the most efficient use of it, spectrum should be allocated in a means similar to the following:

- Four licenses of 15 MHz;
- Two licenses of 10 MHz; and
- Two licenses of 5 MHz.

Note: These bands could be allocated as paired, unpaired, or a combination of both. We feel that technologies that are highly efficient for data traffic services, such as TDD, should be able to operate in large and small networks as the market requires. Requiring that all of the spectrum be divided into large blocks would not be the most efficient use of the spectrum in all markets, and therefore would not be in the public interest. In fact, we would support an allocation similar to those used by PCS markets in that they permit 15, 10, and 5 MHz blocks for various markets. Also, to make the most efficient use of this spectrum, the TDD Coalition believes that the spectrum included in each license should be unpaired and asymmetrical, but TDD technologies also could operate in paired/symmetrical bands. Unlike Nokia, we believe that the advantages of asymmetrical transmissions are available now, and will be more so in the near future. Advanced wireless services **must** consider asymmetrical transmissions methods in the present, not the future, in order to provide the large data transmissions speeds that the public requires to mirror those offered nationally by ISPs.

C. National Telecommunications and Information Administration (NTIA)

In their comments to the FCC on 02-353, the NTIA states:

NTIA (1): "NTIA strongly recommends that the final release of the service rules and the rules regarding allocation actions for comparable spectrum occur simultaneously, thus presenting a complete set of rules to the nation. Delivering a complete picture of the path forward to AWS deployment is essential to ensuring a smooth and orderly implementation."

<u>TDD Coalition Response to NTIA (1)</u>: The TDD Coalition agrees with this comment from NTIA.

<u>NTIA (2)</u>: "In the instant proceeding, the Commission seeks comment on allowing both mobile and base station operations in the 1710-1755 MHz band. If this configuration were permitted commercial stations could transmit at relatively high power levels (up to 1000 watts effective radiated power (BRP)). However, the *NTIA Viability Assessment* considered only low-powered mobile operations in the band, in consonance with the parameters supplied by the Commission for IMT-2000 mobile systems. **All** analyses regarding sharing and electromagnetic compatibility issues in the 1710-1755 MHz band were conducted using the notional IMT-2000 **mobile** parameters. Base stations were *to* be allowed in the 1710-1755 MHz band, transmitted powers could be up to 40 dB higher than those considered in the ***NTIA*** *Viability Assessment.* In that case, the conclusions contained in the *NTIA Viability Assessment* are no longer valid, and a new assessment addressing the sharing and electromagnetic compatibility issues for the accommodation of AWS systems would be required – clearly delaying AWS deployment and potentially resulting in different and less feasible sharing outcomes. Accordingly, NTIA strongly urges the Commission to prohibit base stations in the 1710-1755 MHz band."

<u>TDD Coalition Response to NTIA (2)</u>: The TDD Coalition believes that no delay in AWS deployment would be required if FCC Part 27 rules for "Protection from Interference" served as the model. Relatively high-power level stations would be regulated be relying on signal strength limits, spectral masks, and power limits to facilitate the provision of services and the interference co-existence of service providers. Furthermore, as the Commission is aware, the *NTIA Viability*

Assessment states that “[i]t was envisioned that the 2110-2170 MHz band could be used for the **base station part** of 3G and the 1710-1770 MHz band for the **hand-held units**.” [Note: the NTIA concludes that only the 1710-1755 MHz and 2110-2155 MHz bands are viable for use for 3G operations for reasons mentioned within the *Assessment*.] Although the TDD Coalition agrees with much of the content of the *NTIA Viability Assessment*, we object to FDD-biased definition of 3G that is described above. Although FDD-based 3G implementations require this type of spectrum separation (i.e., transmission in lower band for mobile units, with transmission in upper bands for base stations) to operate, other 3G technology implementations do not. For example, TDD-based 3G implementations both transmit and receive within the same frequency band, thereby offering a higher spectral efficiency (i.e., more bits transmitted per hertz of bandwidth) for an equal amount of spectrum than FDD implementations. It does not promote competition or technology innovations by requiring that all 3G implementations follow the transmission rules outlined by the NTIA. We agree that FDD implementations are an important part of 3G, i.e., for larger PCS operators, but this would not promote the advances in non-FDD 3G technologies that the FCC is striving to bring to market and that new smaller companies are developing currently.

NTIA (3): “The Commission also seeks comments on power or out-of-band emissions limits for the bands being considered. NTIA believes that adjacent band incumbent operations must be protected from interference. Appropriate out-of-band emission limits need to be determined. **NTIA** pledges to work with the Commission to establish such limits in order to protect incumbent users.”

<u>TDD Coalition Response to NTIA (3)</u>: The TDD Coalition agrees with this comment from NTIA.

D. Cellular Telecommunications and Internet Association (CTIA)

In their comments to the FCC on 02-353, the CTIA states:

<u>CTIA (1)</u>: "When establishing spectrum blocks, CTIA urges the FCC to ensure that the licenses are of sufficient bandwidth so as to enable carriers to provide the next generation of broadband services. At the same time, the FCC should make available a sufficient number of entry opportunities in each geographic area for multiple competitors and allow for the dissemination of licenses among a variety of applicants. With these goals in mind, CTIA proposes that the commission establish several different sized paired spectrum blocks; for example one 30 MHz spectrum block (2 x 15 MHz paired) and three 20 MHz spectrum blocks (2 x 10 MHz paired)."

<u>TDD Coalition Response to CTIA (1)</u>: As we have stated previously, the TDD Coalition feels that in order for smaller businesses to be the most fairly able to acquire spectrum, and to make the most efficient use of it, spectrum should be allocated in a means similar to the following:

- Four licenses of 15 MHz;
- Two licenses of 10 MHz; and
- Two licenses of 5 MHz.

CTIA (2): "CTIA strongly supports the Commissions proposal to adopt a geographic area licensing scheme for the AWS bands. CTIA urges the commission to license most of the AWS spectrum using a nationwide or regional approach, with one license reserved for a smaller license area such as the Cellular Market Areas ("CMAs"). CTIA believes this "combination" approach best serves the commission's goal of balancing efficiency with the dissemination of licenses among a variety of applicants."

<u>TDD Coalition Response to CTIA (2)</u>: The TDD Coalition believes that MTA/BTA geographic areas are more appropriate than CMAs. Also, the TDD Coalition disagrees with the notion that FCC Part 24 rules (alone) should apply to this reallocated spectrum.

<u>CTIA (3)</u>: "CTIA strongly supports permitting partitioning and desegregation in the AWS bands. Partitioning and desegregation will allow licensees to use spectrum more efficiently, speed service to underserved areas, stimulate competition, and facilitate the acquisition of spectrum by a variety of entities, both large and small."

<u>TDD Coalition Response to CTIA (3)</u>: The TDD Coalition agrees with this comment from CTIA.

E. Verizon Wireless

In their comments to the FCC on 02-353, Verizon Wireless states:

<u>Verizon (1)</u>: "Third, the Commission should clearly define bands for mobile transmitters and base transmitters. The Commission did not require this in the PCS band. However, it was quite clear from the record that users of broadband PCS spectrum would be offering very similar if not the same services. Thus although the Commission did not clearly define PCS base and mobile transmit bands, it was in the best interest of the carriers acquiring the spectrum to reach private agreements as to the standards of operation in the bands. While the AWS band will be used to complement existing cellular and PCS services, the spectrum is likely to be purchased for a variety of purposes. As a result, the Commission cannot rely on private incentives to ensure the type of interference protection that results from establishing clearly in advance that one set of frequencies will be used for mobile transmit, the other for base transmit."

TDD Coalition Response to Verizon (1): The TDD Coalition disagrees that the Commission should define the bands for mobile and base transmitters, as this **predetermines** the method in which advanced wireless technologies can operate. For example, TDD-based technologies, which offer significant improvements in high-speed data transmission must transmit and receive data in the same frequency band in order to operate. As Part 24.3 "Permissible Communications" states, "PCS licensees may provide any mobile communications service on their assigned spectrum." The AWS service rules should not be more restrictive than the PCS rules have been written.

Verizon earlier in its comments states:

"Given that the types of next generation PCS and cellular or advanced wireless services that carriers will offer in the spectrum are still unknown, the Commission should adopt as flexible a requirement as possible."

This is exactly the point that the TDD Coalition is trying to make, and that Verizon, at least in part, agrees with. Namely, because new **advanced** wireless technologies (which offer significant performance enhancements over current technologies for high-speed data transmission) are still in their developing stages, strictly regulating their operating environment (as Verizon is suggesting), would severely reduce or extinguish the very technologies that the Commission is seeking to bring to market through this reallocation of spectrum.

Verizon (2): The Commission notes that the record shows that AWS licensees will likely employ bandwidth-intensive functions, including high-speed data transfer and internet access, and will offer multimedia applications, such as full-motion video. Verizon Wireless believes that even such high bandwidth services will require spectrum licenses that are paired and symmetrical. Although some may argue that in the short-term spectrum assignments can be either unpaired or asymmetrical, over the longer term, we believe that applications such as voice over IP will require similar size upstream and downstream channel blocks. Again, because of the potential for large bandwidth applications the Commission should create at least one 30 (2x15) MHz paired license. The remaining spectrum should also be allocated in symmetrical pairings, but in a manner that would facilitate building licenses to the size necessary to meet carriers specific needs.

TDD Coalition Response to Verizon (2): The TDD Coalition agrees with Verizon's assessment of the types of "functions" that will likely be offered with the new AWS licenses (i.e., "high-speed data transfer and internet access, and will offer multimedia applications, such as full-motion video"), but we strongly disagree that symmetrical systems are the best way to provide these types of services. TDD-based technologies adapt the spectrum allocation to differences between uplink and downlink traffic, and are inherently more suited from multimedia applications, especially those where the mobile terminal is the source of the video. TDD-based technologies, such as WLAN, are (asymmetrically) able to provide significantly higher performing, less expensive alternatives to 3G "symmetrical" systems in the area of high-speed data/video delivery.

F. AT&T Wireless

In their comments to the FCC on 02-353, AT&T Wireless states:

<u>AT&T Wireless (1)</u>: "While the Commission is correct that licensing the AWS spectrum in varying block sizes would help meet the needs of a wide variety of applicants, none of the blocks should be less than 20 MHz. A 2x10 MHz block provides the minimum needed for implementing AWS services while permitting bidders to acquire more spectrum in a given area if they so desire. The Commission should not divide the spectrum into smaller blocks because such blocks would not serve the majority of carriers' technology plans and would unnecessarily complicate the bidding process, running the risk of "orphaning" slivers of spectrum in every market."

<u>TDD Coalition Response to AT&T Wireless (1)</u>: The TDD Coalition disagrees that smaller spectrum blocks run the risk of being "orphaned". In fact, we believe that these 5 MHz blocks will be particularly popular among smaller carriers that desire to offer WLAN-type products that deliver data more efficiently than FDD-based technologies. We urge the Commission to offer at least one 5 MHz block in each market in order to encourage the deployment of new advanced wireless services nationwide. We agree with AT&T Wireless in that these smaller block sizes "*would not serve the majority of carriers' technology plans,*" but that is the precisely the point: smaller carriers and new promising technologies need a significant place in the new spectrum allocations. By allowing aggregation, larger carriers will be to secure spectrum blocks to meet their requirements.

AT&T Wireless (2): "Creating unpaired bands would undermine the Commission's ability to achieve its spectrum management goals, particularly promoting the most efficient spectrum use. AT&T Wireless appreciates the Commission's commitment to technical flexibility, including the use of time division duplex ("TDD") technologies, but it is concerned about the severe interference TDD causes to frequency division duplex ("FDD") operations in adjacent bands. Just as Chairman Powell recently noted with regard to co-band satellite and terrestrial operations, the mobile nature of the services being provided makes sharing between independent parties using different technologies far less feasible. Since CDMA2000 and W-CDMA technologies employ an FDD transmission mode, authorizing TDD operations in the AWS spectrum would require the creation of large guard bands and the adoption of stringent power limitations. Thus, rather than further the Commission's goals of flexible and efficient spectrum use, licensing unpaired blocks for TDD purposes would impede the speedy deployment of advanced wireless telecommunications services."

TDD Coalition Response to AT&T Wireless (2): The TDD Coalition feels that the single **most efficient use of spectrum** is the concept of allowing technologies (like TDD) to transmit and receive in the same frequency band. In this way, less spectrum is necessary to provide the same service as paired-spectrum technologies that require **twice** the spectrum. It is agreed that TDD and FDD technologies operating in the same spectrum bands offers the opportunity for interference to occur – but that is not the end of the story.

AT&T Wireless indicates in footnote 17 that:

"ITU-R Working Party 8F has developed a report on the coexistence of IMT-2000 TDD and FDD radio interface technologies operating in adjacent bands and in the same geographical area at 2500-2690 MHz. The report concluded that base stations and mobile stations co-located

or in close proximity to each other are likely to experience significant interference that would severely impact user service levels. In order to mitigate such interference, the required separation distances between base stations range from 1 km to 15 km depending upon the cell types involved and carrier separation used."

What AT&T fails to mention is that a follow-up ITU-R report is being developed to show that the interference between TDD and FDD systems can "easily" be mitigated through the use of various techniques: Collocated antennas, orthogonal polarizations, adaptive antennas, and improved filtering and linearization. The truth is, FDD has been traditionally deployed because in the past the techniques to isolate interference between TDD and FDD were too costly, or had not been developed. In fact, the follow-up IMT-31 report indicates that "large guard bands" would not be necessary if a combination of the techniques mentioned above were implemented within carrier networks. For these reasons, the TDD Coalition strongly urges the Commission to permit the use of TDD-based technologies within the 1710-1755 MHz and 2110-2155 MHz bands.

V. **CONCLUSION**:

The regulations should be "technology agnostic," allowing for spectrum users to select the appropriate solution for specific market conditions and be able to adapt new technologies when conditions change. As recommended in the report, the regulations should limit technical rules to RF requirements, such as power limits and interference standards, which are necessary to protect spectrum users against harmful interference. A good example of this is the rules proposed by the WCAI Engineering Task Force for the MMDS/ITFS band. These proposed changes defined rules for sharing the band between both TDD and FDD technologies. By defining interference limits at the band edge and coverage edge, users of disparate technologies can still coexist. The regulations should not place any artificial or arbitrary limitations on technology.

The TDD Coalition wants to remind the Commission that TDD technologies can use unpaired spectrum to deliver effective communications services. By using the same spectrum for both upstream and downstream communications, TDD allows the introduction of new innovative data services while not requiring paired frequency allocations. In certain cases, TDD can make overall spectrum usage more efficient by utilizing spectrum that otherwise would remain fallow.

The member companies of the TDD Coalition supporting this filing are:

Aperto Networks	Harris Corporation
ArrayComm	InterDigital Communications
BeamReach Networks	LinkAir Communications
Broadstorm, Inc.	Navini Networks

Respectfully submitted,

TDD COALITION

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March 14, 2003